2.0 PROBLEM IDENTIFICATION

2.1 GENERAL

This section presents the results of the first and second major steps in the planning process, the specification of water and related land resources problems and opportunities, and the forecast and analysis of water and related land resources in the study area. Presented is a description of the affected environment, problems and opportunities, and planning constraints. The problems this project addresses are: 1) the regional decline in tidal marsh habitat, and 2) constraints on dredged material disposal capacity in the Bay Area due to environmental and navigation concerns. Opportunities that the project would realize include endangered species habitat restoration and beneficial reuse of dredged material. Addition of the BMKV parcel would substantially enhance the opportunities at the HWRP, increasing the ability of the project to provide endangered species habitat as well as to beneficially reuse dredged material. Operational flexibility and value engineering opportunities would also be realized if the HWRP were expanded to include the BMKV parcel**.** References are provided in PWA, 1998, as documented in Section 1.4.

2.2 STUDY AREA DESCRIPTION

The Hamilton Wetlands Restoration Project and Bel Marin Keys Unit V are located 25 miles north of San Francisco on the southeast edge of the City of Novato, Marin County, California (Figure 2-1). San Pablo Bay is adjacent to HWRP and BMKV on the southeast side. Properties owned by the St. Vincent Catholic Youth Organization and Las Gallinas Valley Sanitary District lie to the south, while the Bel Marin Keys I-IV residential community and Novato Creek border the north. The Novato Sanitary District's sewer outfall pipeline runs along the border of the HAAF site and the SLC and BMKV properties. Five Pacific Gas and Electric (PG&E) high voltage power line towers on the Vaca-Ignacio Line are located on the BMKV parcel (Figures 3.1-3.3). These properties historically supported tidal salt marsh habitat, but levee construction separated the area from the tidal influence of San Pablo Bay. Desiccation of the native Bay Mud soils and human activities have resulted in lowered surface elevations.

The term 'study area' refers to the area that would be affected to a significant degree by implementation of any of the alternative plans considered in this study. The study area for the reauthorization (Figure 2-2) includes the authorized HWRP project area as well as the proposed BMKV expansion area and consists of five parcels of land: (1) the 644-acre HAAF parcel (HWRP), (2) the 18-acre Navy Ball Fields to the southwest (HWRP), (3) the 319-acre State Lands Commission property (former Hamilton Antenna Field, HWRP) to the northeast, (4) the 1,610-acre SCC property (BMKV) to the northeast, and (5) 2 acres of the "Bulge" property to the west of HAAF, currently owned by the City of Novato. These five parcels occupy 2,600 acres, including 6 acres of levee easement from the City of Novato and 0.76 acre for pipeline placement to be provided through the Navigation Servitude. The remainder of the original 2,184-acre air base is outside the project footprint, and is being developed as residential, light industrial, and open space areas. A summary of the proposed changes to the authorized HWRP as a result of the BMKV expansion is presented in Chapter 6. Note, for the SEIR/EIS, project

effects on Novato Creek, Pacheco Pond, Arroyo San Jose, and Pacheco Creek were assessed in issue areas where such off-site effects were identified to occur. Thus the study area for the individual subject areas was broader than the expansion site itself in areas such as hydrology and tidal hydraulics and water quality.

2.3 EXISTING CONDITIONS

2.3.1 Real Estate Parcels Considered

The BMKV parcel lies on the northern border of the airfield and to the west and north of the SLC parcel. This parcel was historical tidal marsh. The property has recently been in agricultural use (hay production). The former property owners intended to develop this parcel as a residential community and golf course. However, the non-federal sponsor has recently acquired this parcel and it is available for restoration. An additional parcel, a portion of the area commonly referred to as the 'bulge' area will be required as an access area. The parcel is located adjacent to the west of the HWRP (HAAF panhandle area), is currently owned by the City of Novato and will be acquired by the Coastal Conservancy on a fee basis. The Access Area will accommodate a display board, parking area, and restrooms. The gross appraisal for these parcels is presented in Appendix F in the Real Estate Plan.

2.3.2 Land Use

The BMKV site consists of former baylands that were diked for agricultural use in the late 19th century. In the mid-1800s, the shoreline was located just east of the BMK residential area. The area west of the shoreline was tidal marsh and salt pond, including the location of the BMK community, the western side of BMKV and Pacheco Pond. In the mid to late 1800s, hydraulic mining resulted in accretion of sediment along the shoreline. In the recent past, the majority of the BMKV site has been under cultivation for oat hay, with the exception of two fields where placement of dredged material was authorized in the 1980s, and which have subsequently been left fallow. The northern and western portions of the site support actively farmed hayfields with sparse to moderately dense inclusions of low-quality seasonal wetland habitat. This area also supports fallow croplands with sparse inclusions of alkali/saline meadow and moderately dense inclusions of low-quality seasonal wetland. The southeastern corner of the site is ruderal herbaceous upland that appears to have been farmed in the past and now supports sparse inclusions of alkali/saline meadow and moderately dense inclusions of low-quality seasonal wetland. Seasonal wetland inclusions are dominated by nonnative species and locally support minimal vegetative cover. The east margin of the BMKV site, outboard of the levee along San Pablo Bay, supports tidal marsh habitat. Pickleweed occupies high marsh areas, while cordgrass occurs in the low marsh along slough channel banks and adjacent to the Bay. A similar habitat distribution characterizes the northern margin of the site along Novato Creek.

An analysis of the potential extent of jurisdictional waters of the United States on the BMKV site was conducted in 1997 by LSA Associates. The site supports 1,360 acres of agricultural lands (hayfields) and 250 acres of nonagricultural lands (levees, ditches, and uncultivated land).

LSA's 1997 analysis concluded that a total of 369 acres of jurisdictional wetlands occur on the site, including 151 acres within agricultural lands, and 218 acres in nonagricultural lands.

The habitats present at the BMKV site include aquatic, wetland, and grassland communities and developed areas. A small riparian area (Pacheco Pond) is present in the western portion of the property. A substantial portion of the project site is agricultural land. These habitats and the plant and wildlife species associated with the BMKV site are described below. Habitat types and acreages are derived from the results of previous habitat inventories of the project area.

Aquatic Communities

Aquatic communities found in the expansion area include subtidal aquatic (i.e., aquatic habitats that are never exposed during low tide), intertidal aquatic (i.e., emergent marsh habitat and mudflats that are exposed during low tides), and brackish open water habitats. Each of these is described below.

Subtidal Aquatic Habitat

Subtidal aquatic habitats are areas of continuous open water that are submerged during even the lowest tide; as a result, these areas are too deep to support the types of vegetation found in emergent (i.e., occasionally exposed) marsh habitat. Phytoplankton, zooplankton, and fish, such as longfin smelt, northern anchovy, speckled sanddab, and staghorn sculpin, occupy subtidal aquatic habitat. Benthic (bottom-feeding) organisms, such as worms and clams, can be found in the sandy, muddy bottom. Many species of waterfowl and diving birds use subtidal aquatic habitat for feeding areas.

Intertidal Aquatic Habitat

Intertidal aquatic habitat comprises two subtypes of habitat, intertidal mudflats and coastal salt marsh. Emergent coastal salt marsh is discussed in detail as part of the Wetlands Communities description, below. Intertidal mudflats are made up of unconsolidated, muddy bottom areas without vegetation and are present along the coastal salt marshes that are outboard of the perimeter levee. Mudflats are exposed twice daily during low tide and extend to the extreme low water elevation. Narrow bands of mudflat are also found at the same elevations along the margins of subtidal channels in tidal marshes. Mudflats are highly productive and support large populations of benthic organisms, including aquatic worms, crustaceans, and mollusks that are important elements of the estuarine food web. When exposed or covered by shallow water, mudflats provide important foraging areas for migrant and wintering shorebirds, wading birds, and gulls.

Brackish Open Water Habitat

Brackish open water habitat occurs on approximately 52 acres of the BMKV site and includes one of the borrow pits and the drainage ditches. Borrow Pit A is 10-15 feet deep, intersects the water table year-round, and is perennially inundated in all but drought years (LSA Associates 1997). Open water in the borrow pit ponds is used by water birds during migration and provides foraging areas for resident waterfowl (Environmental Science Associates 1993). The approximate size of Borrow Pit A is 15 acres.

Drainage ditch banks and channels also provide foraging habitat and cover for some species, such as herons, egrets, and dabbling ducks, and movement corridors for striped skunks, raccoons, and other species. The area of the drainage ditches is approximately 36 acres and includes small amounts of brackish marsh vegetation along the edges of the ditches.

Wetland Communities

The expansion area contains four types of non-agricultural wetland communities: coastal salt marsh (tidal), coastal salt marsh (nontidal), small amounts of brackish marsh in the drainage ditches, and seasonal wetland. In addition, seasonal ponding occurs within the cultivated fields, though it varies in magnitude from year to year. Delineation of jurisdictional wetlands has been completed for the BMKV parcel (LSA Associates 1997) and has been verified by the Corps and the Natural Resources Conservation Service (NRCS). All of the non-agricultural wetland types, except brackish open water, are considered jurisdictional wetlands by the Corps in accordance with the Clean Water Act. Approximately 151 acres of cultivated fields have also been delineated as jurisdictional agricultural wetlands based on determination of a statistically derived average ponding area, in addition to vegetation and soils criteria (LSA Associates 1997).

Coastal Salt Marsh (Tidal)

Coastal salt marsh under tidal influence occurs in two locations in the expansion area: between the levee at the eastern end of the expansion area and the open water of San Pablo Bay, and between the northern levee and Novato Creek. Approximately 20 acres of salt marsh habitat occurs within the BMKV site, but more substantial areas are located outside the site. This habitat can be divided into three distinct zones based on the frequency and duration of tidal inundation. These zones are described below.

- Low marsh habitat occupies the elevations between mean tide level and mean high water and, as such, is inundated daily. In the expansion area, low marsh is adjacent to the open waters of San Pablo Bay and Novato Creek and is dominated by California cordgrass.

- Middle marsh habitat occupies the elevations between mean high water and mean higher high water. It is predominant outboard of the perimeter levee and is inundated frequently throughout each month, although for shorter periods than low marsh. Middle marsh is dominated by common pickleweed.

- High transitional-marsh habitat occupies the elevations between mean higher high water and the highest tide level. This habitat is inundated infrequently and for short periods. A narrow strip along the bayside of the levee supports high marsh and plant species that are tolerant of saline conditions but not adapted to frequent, long-term inundation, including saltgrass, alkali heath, fat-hen saltplant, and gumplant.

The tidal coastal salt marsh community provides food, cover, and breeding habitat for many wetland-dependent wildlife species. The dense vegetation and large invertebrate populations typically associated with salt marshes provide ideal foraging conditions for a variety of bird species, including rails, egrets, herons, waterfowl, and shorebirds. Emergent marsh habitat also provides nesting, foraging, and escape cover for various songbirds and wading birds. The

vegetation in the marsh habitat is used as direct cover and sources of food by rearing juvenile and adult fish, such as longfin smelt, chinook salmon, and steelhead. Emergent marsh habitat is within the tidal zone and drains frequently; it is therefore not used for spawning. Benthic organisms use this habitat in the same way they use intertidal mudflats.

In addition to being important habitat for wetland-associated wildlife, the salt marsh community is also an important component of the San Pablo Bay ecosystem, providing nutrients and organic matter to the mudflats and open water of the Bay. These, in turn, are important habitats for a variety of waterfowl, shorebirds, and other water birds. Wildlife species observed at the proposed wetland restoration site during field surveys conducted in 2001 and 2002 include Double-Crested Cormorant, Great Blue Heron, Great Egret, American Coot, Killdeer, Northern Harrier, Salt Marsh Common Yellowthroat and San Pablo Song Sparrow (May & Associates 2001; Jones & Stokes files 2002). Other species expected to use tidal coastal salt marsh include the raccoon, Mallard, Sora, Virginia Rail, and Willet.

Coastal Salt Marsh (Nontidal)
Small areas of coastal salt marsh vegetation that are not inundated by tides (approximately 21 acres total) are located along the interior slopes and base of levees along Novato Creek and San Pablo Bay and in two of the borrow pits. Dominant species include pickleweed, saltgrass, brass buttons, ryegrass, and coyote brush. These habitat areas may provide important refuge for wildlife associated with tidal salt marsh during periods of extreme high tides (Environmental Science Associates 1993).

Brackish Marsh
Small amounts of brackish marsh vegetation are present along the edge of the drainage ditches in the BMKV parcel, as discussed above. Dominant emergent wetland plants along drainage ditches are alkali bulrush and cattail. Because marsh vegetation associated with ditches occurs in narrow linear bands, these habitat areas typically support a lower diversity of wildlife than larger, more contiguous units of brackish marsh. The area of the brackish marsh vegetation has not been estimated.

Seasonal Wetlands
Areas of seasonal wetland (approximately 114 acres total) are present in the field at the west end of the site, adjacent to the borrow pits, and in the dredged material disposal field. Plant species that may dominate in seasonal wetland habitat are saltgrass, alkali heath, salt marsh bulrush, fat-hen saltplant, western goldenrod, sheep sorrel, 6-weeks fescue, tall fescue, sedge, rush, and creeping wild rye (Environmental Science Associates 1993).

Seasonal wetlands potentially provide high-tide refugia for California Clapper Rail, California Black Rail, and other species that use tidal coastal salt marshes; seasonal foraging and resting habitat for migratory shorebirds, waterfowl, and other water birds; and foraging habitat for raptors, herons, egrets, blackbirds, raccoons, striped skunks, and aquatic garter snakes (Environmental Science Associates 1993).

Agricultural Wetlands

During winter, some of the agricultural fields become saturated or seasonally flooded with runoff from precipitation. Flooded fields provide foraging and resting habitat for a wide diversity of wintering and migrant shorebirds, waterfowl, and other water birds during winter. Based on a statistically derived average ponding area, approximately 151 acres of agricultural wetlands have been delineated on the BMKV site (LSA Associates 1997). Because ponding amounts can vary in location and size by year, these areas have not been mapped.

Grassland Communities

Grassland communities in the project area include annual grassland vegetation as well as agricultural lands.

Annual Grassland

Annual grassland vegetation in the expansion area (approximately 129 acres total) is ruderal (i.e., grows in disturbed areas) and is dominated by weedy, non-native annual grasses and forbs, such as ripgut brome, wild oats, Mediterranean barley, perennial ryegrass, yellow star-thistle, curly dock, bristly ox-tongue, and black mustard. Scattered shrubs and non-native trees, such as coyote brush, blackberry, and eucalyptus, are also present in some grassland areas (Environmental Science Associates 1993).

Annual grassland provides important habitat for various wildlife species. Representative wildlife species observed using grasslands at the expansion site are the Turkey Vulture, White-Tailed Kite, Northern Harrier, Red-Tailed Hawk, Golden Eagle, American Kestrel, Short-Eared Owl, Savannah Sparrow, Western Meadowlark, and Brewer's Blackbird (May & Associates 2001; Jones & Stokes files).

Agricultural Lands

Most of the proposed wetland restoration site (approximately 1,241 acres) is composed of agricultural fields that are planted and harvested annually. Approximately 75% of these lands are managed for oat hay production. Following the harvest, fields remain fallow until the following planting season. When fallow, the fields typically support non-native invasive plants such as star thistle (Environmental Science Associates 1993). Cultivated fields, particularly when fallow, provide habitat values similar to grasslands and provide habitat for raptors, songbirds, and small mammals. As noted above, approximately 151 acres of the agricultural land has been delineated as agricultural wetlands.

Riparian Habitat (Pacheco Pond and Vicinity)

Pacheco Pond is heavily used both in winter and summer by a variety of water birds, including waterfowl, grebes, loons, cormorants, rails, pelicans, coots, moorhens, terns, gulls, herons, egrets, shorebirds, and blackbirds. A number of species breed in the surrounding area due to the presence of a surrounding cattail marsh that provides food and cover. The pond itself also reportedly supports a number of fish species, including striped bass, smelt, and bullhead.

The confluence of Pacheco Creek and Arroyo San Jose creates a riparian area on the western side of Pacheco Pond that supports willows, non-native berries, and other freshwater riparian species.

Saltmarsh Common Yellowthroat has previously been observed in the wetland/riparian area north and east of Ammo Hill (U.S. Army 1996). Northwestern pond turtle has been found in or near this area (Lewis 2002). Chinook salmon have also been reported spawning in Arroyo San Jose Creek above Highway 101, upstream of Pacheco Pond (Lewis 2002). A red-legged frog survey has been conducted in or near the confluence area, but no frogs were located (Lewis 2002). Based on aerial photography, much of the area of a potential alignment near the confluence appears likely to be wetland. It is probable that the area between the northern end of the Marin County Flood Control access road and Bel Marin Keys Boulevard is also wetland.

Developed Areas
Human-made structures present within the expansion area include drainage pump stations, small out buildings, and utility infrastructures. Compared to vegetated habitats, these developed areas support a low diversity of wildlife. Species commonly associated with developed areas include the Barn Swallow, Northern Mockingbird, American Crow, and European Starling.

2.3.3 Special-Status Species

Fourteen special-status plant species have potential to occur on or near the BMKV parcel; however, surveys indicate that they are not present on the BMKV parcel. No special-status plant species have previously been reported from the expansion area (Natural Diversity Data Base 1997). Potentially suitable habitat is present in the expansion area for only three of those species: soft bird's-beak, Point Reyes bird's-beak, and Marin knotweed (Environmental Science Associates 1993). This potential habitat is associated with the transitional zone at the upper margins of coastal salt marshes. These species were not found during rare plant surveys conducted in 1980, 1985, 1988, 1991, and 2001 (Environmental Science Associates 1993, May & Associates 2001). Therefore, the SEIS/R assumed that special-status plant species are not present in the expansion area and will not be affected by the proposed BMKV expansion.

Seventeen special-status fish and wildlife species are known to occur or are assumed to use suitable habitat within diked portions of the expansion area or in marshes and aquatic habitats bayside of the perimeter levees. These species are listed below.

- Longfin smelt
- Steelhead (Central Valley and Central California Coast ESUs)
- Chinook salmon (Sacramento River Winter-run, Central Valley Spring-run, and Central Valley Full-run ESUs)
- Coho salmon (Central California Coast ESU)
- Double-Crested Cormorant
- California Brown Pelican
- White-Tailed Kite
- Northern Harrier
- Golden Eagle
- Peregrine Falcon
- California Clapper Rail
- California Black Rail
- Short-Eared Owl

- Burrowing Owl
- Saltmarsh Common Yellowthroat
- San Pablo Song Sparrow
- Salt marsh harvest mouse

A complete list of potential special-status species is contained in the 2002 Supplemental EIS/R attached to this GRR. No trapping has been conducted to determine the presence of the salt marsh harvest mouse; however, as for the previous feasibility study for the HWRP, this study assumes that the mouse is present in the existing pickleweed marsh.

2.3.4 Hazardous, Toxic, and Radiological Wastes (HTRW)

Areas of potential concern on the BMKV site include a former Aboveground Storage Tank (AST) area, the west barn, the east barn, the crop duster and drainage ditches, and a debris pile. Total Petroleum Hydrocarbon as diesel (TPH-d), 4,4-DDE, 4,4-DDD, 4,4-DDT, dioxin, and metals (arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, zinc) have been detected in shallow soil samples. A Phase I Preliminary Environmental Site Assessment was completed in May 2000, before the SCC purchased the property. The results of follow-up sampling was presented in "Results of Shallow Soil Investigations" by Erler and Kalinowski in March 2002. These documents are attached to this GRR as Appendix B. Any remediation required for the Access area to be located on a portion of the 'bulge' parcel is the responsibility of the SCC. The SCC has coordinated with the Department of Toxic Substances Control (DTSC), and does not expect HTRW remediation to delay the expansion of HWRP to BMKV.

2.3.5 Regional Hydrology

The San Francisco Bay estuary is one of the largest and most significant estuaries along the western coast of the United States. Over 40% of California's land area and 60% of the volume of the state's runoff drains into the estuary (EPA et al., 1996). The HWRP, including the BMKV parcel, is located along the northwestern shore of San Pablo Bay, in the northern reach of the estuary.

San Pablo Bay is a large, shallow estuary. Typical water depths in San Pablo Bay are 6 feet at low water. A naturally deeper, periodically dredged, navigational channel maintained at -35 feet mean lower low water (MLLW) extends through the Bay between Point San Pedro and the Carquinez Strait. A 3,500-foot-wide expanse of mudflat in San Pablo Bay, adjacent to the project site, is exposed at low tide.

San Pablo Bay is subject to semidiurnal tides with a 6-foot range. Tidal characteristics for San Pablo Bay at the mouth of the Petaluma River north of BMKV are presented in Table 2-1. Monthly variation in tidal fluctuations (not shown in Table 2-1) create cycles of extreme high and low tides, called spring tides, and less pronounced tides, called neap tides. The values in Table 2-1 are for current mean sea level elevations for San Francisco Bay. Mean sea level is expected to rise by 1 foot per 100 years as a result of global warming trends (IPCC, 1996). The

100-year tide is based on an estimate of 6.5 feet National Geodetic Vertical Datum (NGVD) by the USACE (1984). Phillip Williams and Associates, Ltd. (PWA) adjusted this value upward to 7 feet to account for the effects of a number of factors including mean sea level rise; wind-induced set-up within San Pablo Bay; wave run-up on the adjacent mudflat; flood runoff from the Sacramento-San Joaquin Delta; and uncertainties in the USACE's estimation methods (Knuuti, 1995).

Regional drainage features include Pacheco Creek, Arroyo San Jose, and Novato Creek. Pacheco Creek traverses the southwestern side of the HWRP and BMKV area. Pacheco Creek drains into Pacheco Pond, located adjacent to HWRP's northwestern boundary. Arroyo San Jose, a slightly larger stream draining a 5.4-square-mile area, also drains into Pacheco Pond, but does not cross base property. Pacheco Pond provides temporary storage prior to draining through flap-gates to Novato Creek, which is fully tidal at its confluence with the Pacheco Pond outflow.

Surface water runoff from the areas west of the project site is carried by Pacheco Creek and Arroyo San Jose. Historically, these streams were part of a network of natural channels that drained through the low-lying area, where Pacheco Pond (also known as Ignacio Reservoir) is now located, to Novato Creek. Pacheco Creek and Arroyo San Jose both have their headwaters on Big Rock Ridge, at elevations of 1,300–1,600 feet NGVD. Pacheco Creek has a watershed area of 1.9 square miles and Arroyo San Jose has a watershed area of 5.4 square miles. Pacheco Pond drains to Novato Creek through a leveed channel with a flap gate outlet (Bissell & Karn/Greiner 1993 and unpublished Corps data).

Although Pacheco Creek, Arroyo San Jose, Novato Creek, and Pacheco Pond are not connected to the HWRP and BMKV site drainage during average runoff conditions, they become important sources of flow to the site during flood conditions. This issue is discussed further in the following local hydrology section.

Table 2-1 Tidal Characteristics at Bel Marin Keys and Hamilton Wetland Restoration Project (based on Petaluma River Entrance Tide Gauge #941-5252)

	NGVD Datum (feet)	MLLW Datum (feet)
100-year high tide	7.00*	9.63
10-year high tide	6.00	8.63
Mean highest annual tide	4.68	7.31
Mean Higher High Water (MHHW)	3.43	6.06
Mean High Water (MHW)	2.86	5.49
Mean Tide Level (MTL)	0.61	3.24
Mean Low Water (MLW)	-1.63	1.00
Mean Lower Low Water (MLLW)	-2.63	0.00

*The 100-year tide is based on an estimate of 6.5' NGVD by USACE (1984). For design purposes, this has been adjusted upward to 7.0 feet to account for the effects for a number of factors: mean sea level rise; wind-induced set-up within San Pablo Bay; wave runup on the adjacent mudflat; flood runoff from the Sacramento-San Joaquin Delta; and uncertainties in the estimation methods. (HWRP Feasibility Report, U.S. Army Corps of Engineers, 1998)

Note: NGVD is mean sea level of 1929.

Sources: USACE SFD (1984), Tides and Currents tide prediction software, National Oceanic and Atmospheric Administration (NOAA) tidal benchmark data (1998), NOAA NCDC database EarthInfo, 1997, on CDROM, Hamilton ADB Station, period of record 1948-1964.

2.3.5.1 Local Hydrology

The HAAF, SLC, and BMKV parcels are all served by local drainage facilities, including drains, channels, culverts, and pump stations with outfalls into San Pablo Bay. Ground elevations in these areas are generally from 0 to -4 feet NGVD, several feet below the mean higher high water (MHHW) elevation of 3.4 feet. Major drainage features and hydrologic resources in the project area are described briefly below.

Pacheco Creek

Pacheco Creek originates on Big Rock Ridge three miles west of HWRP and BMKV at an elevation of 1,300 feet and drains a watershed of approximately 1.9 square miles. The creek crosses U.S. Highway 101 near the Alameda del Prado/Nave Drive, and crosses Nave Drive, Marin Valley Road, Bolling Drive, Main Entrance Road, and State Access Road in a series of culverts. The 10-year and 100-year peak discharges for Pacheco Creek were computed in 1993 by Bissell & Karn/Greiner to be 470 and 770 cubic feet per second (cfs), respectively. In 1998, Phillip Williams and Associates calculated them to be 582 cfs and 1,041 cfs, respectively.

The lower reach of Pacheco Creek is defined as the region downstream of the Northwest Pacific Railroad Bridge crossing. In this reach, overtopping due to downstream backwater effects is known to occur for flows smaller than the 10-year event (California State Coastal Conservancy, U.S. Army Corps of Engineers and Phillip Williams and Associates, 1998). When flooding occurs, overflow was formerly directed toward Landfill 26 and back to Pacheco Pond over the

Ammo Hill saddle. However, the Army has recently completed a berm to prevent such flows east of Landfill 26.

Arroyo San Jose

Arroyo San Jose also originates on Big Rock Ridge, five miles west of the HAAF and BMKV parcels at an elevation of 1,600 feet and drains a watershed of approximately 5.4 square miles. The creek crosses U.S. Highway 101 near the Ignacio Boulevard/Bel Marin Keys Boulevard interchange and discharges into Pacheco Pond. In 1993, Bissell & Karn/Greiner computed the 10-year and 100-year peak discharges to be 1,200 and 2,300 cfs, respectively. In 1998, Philip Williams and Associates (PWA) calculated the 10-year and 100-year discharges to be 1,369 and 2,455 cfs, respectively. Arroyo San Jose accounts for approximately 75% of the inflow to Pacheco Pond (PWA, 1998). Arroyo San Jose is expected to remain within its banks during floods as large as the 100-year event, with the exception of the lower reaches where high stages in Pacheco Pond can cause overtopping due to backwater effects.

Pacheco Pond

Both Pacheco Creek and Arroyo San Jose discharge into Pacheco Pond (also called Ignacio Reservoir). This reservoir was built by the developer of Ignacio Business Park and deeded to Marin County Flood Control and Water Conservation District (MCFCWCD) as a detention basin for flows from Pacheco Creek and Arroyo San Jose. It also provides freshwater wetland and wildlife habitat, and is operated jointly by MCFCWCD and the California Department of Fish and Game. The pond occupies 120 acres and has a storage capacity of approximately 866 acre-feet at an elevation of approximately 7 feet NGVD. (Appendix E, NHC Memo) The pond discharges to Novato Creek through a leveed channel with an invert elevation of -.86 feet NGVD, controlled by six 4-foot by 4-foot flap gates. (PWA, 1998) The outlet is located at the Bel Marin Keys Boulevard bridge. High tides in San Pablo Bay prevent outflow from Pacheco Pond and may cause flow reversal in the outlet channel if the flap gates do not operate properly (Bissell & Karn/Greiner 1993). Ground elevations near the reservoir are near mean sea level.

Water surface elevations in Pacheco Pond can be controlled by a sill at the upstream face of the Bel Marin Keys Boulevard culvert. The minimum pond elevation can be raised by inserting flashboards on the upstream side of the culvert. An operating agreement between MCFCWCD and Department of Fish and Game (DFG) establishes the desired water-surface elevation in the pond water at 1.5 feet above NGVD. The minimum pond water surface elevation is equivalent to the sill elevation of the culvert (approximately -.86 feet NGVD). The reservoir is also operated to provide freshwater wetland and wildlife habitat.

During high-flow events, the water level in Pacheco Pond may exceed the elevation of adjacent levees. The lowest point in the levees (elevation 5.6 feet NGVD) is north of the pond, in the outlet channel, adjacent to the Leveroni property. Overtopping has also been observed on the west side of the pond near Ignacio Business Park and near the confluence of the outflow channel with Novato Creek.

Novato Creek

Novato Creek is the principal drainage in the vicinity of the expansion site and has an approximate total watershed area of 44 square miles. The Corps has computed 10- and 100-year

discharges near the Highway 101 crossing to be 3,420 and 6,230 cfs, respectively, and recognizes an "ultimate flow" of 8,000 cfs at the mouth of Novato Creek. However, the railroad bridges downstream of Highway 101 and adjacent to Highway 37 constrict flow, causing overtopping upstream of the lowest reach of Novato Creek and reducing the actual discharge in the lower reaches of the creek. The 8,000 cfs value in particular is unlikely to pertain to the reaches of Novato Creek adjacent to the BMKV site (CSW/Stuber-Stroeh Engineering Group 1996).

Recent modeling efforts have shown that the tidal influence extends upstream of Highway 101 to the City of Novato during flows greater than the 10-year event (PWA 1998). The maximum water surface elevation observed at the Highway 37 crossing was approximately 7 feet NGVD (PWA 1998).

Top-of-levee surveys completed in 1996 indicate that the levee crest between Novato Creek and the BMKV site dips to an elevation of approximately 5.6 feet NGVD, at a point approximately 1,000 feet downstream from the BMKV south lagoon navigation lock (Jones and Stokes 1996). Overtopping of this levee was observed by BMK residents in the February 1998 flood event.

Bel Marin Keys Residential Development

The BMK residential development is located adjacent to the northwest boundary of the expansion site. BMK is a waterfront residential community with 2 internal constructed lagoons that offer access to Novato Creek through a system of locks. The BMK community uses Novato Creek for boat access to San Pablo Bay and relies on tidal changes in water level to periodically exchange flow between the BMK lagoons and San Pablo Bay. The community is susceptible to flooding during extreme high tide stages. Storm drainage to the lagoons is aggravated by coincident high Novato Creek stages, caused either by high San Pablo Bay tides or high Novato Creek discharge, with high amounts of local precipitation over the BMK development. Water level is managed at 2 feet NGVD in the north lagoon and 0.5-1 foot NGVD in the south lagoon (CSW/Stuber-Stroeh Engineering 1996). Stormwater is discharged to Novato Creek via the boat access lock. Stormwater from the south lagoon can also be discharged onto BMKV via a weir in the levee on the eastern edge of the south lagoon. Discharge into Novato Creek is limited by stage in the creek; during high-flow periods, runoff is impounded in the lagoons until flow recedes (CSW/Stuber-Stroeh Engineering 1996).In 1997, the former owner of the BMKV property granted the BMK Community Services District (CSD) the right to construct, maintain, and repair an emergency spillway on the existing levee, the purpose of which is to relieve high water in the lagoon surrounding Units III and IV of the BMK subdivision. This agreement also granted the right to discharge water from the lagoon onto a 3-acre portion of the BMKV property when the lagoon and Novato Creek reach a level of 1.5 NGVD.

Bel Marin Keys Drainage
The BMKV parcel is currently in agricultural use and is drained by a system of channels. Under normal runoff conditions, most of the runoff from the parcel drains to a pump station at the northeast corner of the property that discharges to San Pablo Bay. One hundred acres drain to the channel system on the SLC parcel to the east, and these flows are conveyed by gravity to the HWRP perimeter ditch system through two 24-inch culverts. During flood conditions, drainage may flow into or from the BMKV site through a levee gap in the northwest corner of HAAF and/or a levee gap between HAAF and the SLC parcel, as described in the following two sections.

Hamilton Army Airfield Drainage
Drainage from the HAAF parcel is collected in a perimeter ditch system and conveyed to three pump stations on the margin of San Pablo Bay. The drainage system is described in detail in an engineering evaluation of the ditch system prepared by International Technology Corporation for the Corps (U.S. Army Corps of Engineers 1997). Drainage subareas for the HAAF parcel are delineated in the Flood and Drainage Baseline Study.

The perimeter ditch system is served by three pump stations on the margin of San Pablo Bay: Buildings 35, 39, and 41. These pump stations have a combined capacity of 230 cfs and are equipped with both diesel-powered and electric motor-driven pumps (unpublished Corps data).

In addition to the HAAF parcel, the perimeter ditch system receives drainage from several adjacent areas:

- drainage flows through a 42-inch gated culvert through the perimeter levee near the southwest corner of HAAF on the St. Vincent's property, which carries flows from the western portion of the former Department of Defense (DOD) housing and Long Point peninsula upland areas adjacent to the airfield, and from a portion of the St. Vincent's property;

- drainage from the New Hamilton Partnership development, the eastern portion of the former DOD housing area, and other areas adjacent to the west side of the airfield that are conveyed to the ditch in two outfalls, one near Reservoir Hill (west outfall) and one near the southwest corner of the airfield (east outfall);

- drainage from the area of Landfill 26 and Ammo Hill that is conveyed to the ditch system through a 48-inch flap-gated culvert;

- flood overflow (under some conditions) from Ignacio Reservoir and the BMKV parcel through a levee gap 2,000 feet southeast of the northwest corner of the HAAF parcel;

- flood overflow and normal drainage through two 24-inch gated culverts on the SLC parcel.

- In addition, flood overflow from Pacheco Pond could be conveyed from Pacheco Pond to HAAF through the two 24-inch siphons (these siphons are currently not operational).

California State Lands Commission (SLC) Parcel
The SLC parcel presently drains to the HAAF perimeter ditch system through a network of channels on the SLC parcel. Flows in the channel system are conveyed to the HAAF perimeter ditch system near the Novato Sanitary District (NSD) dechlorination facility in two 24-inch pipes. The HAAF perimeter ditch system conveys these flows to HAAF pump stations that discharge to San Pablo Bay. Under extreme flow conditions, water may overtop the low levee between SLC and HAAF.

2.3.6 Geotechnical Conditions

The area of the proposed wetland restoration is presently below sea level and is protected from tidal inundation by flood control levees along San Pablo Bay and a system of drainage trenches and pumps. The water table is typically located several feet below the surface, and is seasonally variable. The area is underlain, below a thin near-surface "crust", by soft marine clays known as Bay Mud. The crust is composed of desiccated Bay Mud over the entire area. Bay Mud is a plastic silty clay, with high compressibility, low shear strength, and generally low permeability. Bay Mud is underlain by much stronger and less compressible, competent soils. Due primarily to its high compressibility and low strength, the soft Bay Mud poses considerable challenges to development of the site as a wetland. New fill loads (i.e., any dredged sediment imported to raise grades at the project area) placed on top of areas underlain with Bay Mud cause compression of the mud, which in turn requires more fill to be placed. This compression also causes uneven settlement of the surface. Depending on the depth of the soft Bay Mud, the settlement may take from 10 to as much as 50 years to develop.

Fills applied over limited areas, such as levee fills, cause shear stresses in the Bay Mud that will cause stability failures if they exceed the soil's shear strength. Therefore, new levees need to be designed with geometries that provide adequate stability; this may require stabilizing berms. Please refer to the Geotechnical Appendix for a detailed description.

2.3.7 Observed Sedimentation Rates

Observed sedimentation rates adjacent to San Pablo Bay at Port Sonoma Marina, Bel Marin Keys, and the Petaluma Marsh range from 0.5 to 1.3 feet/year, and suggest an average initial rate of one foot per year. These estimates are based on measurements of bed elevation changes in these maintenance dredging and wetland restoration sites. However, the observed sedimentation rates are representative of subtidal or subsided systems. As the site fills and becomes intertidal, water depths, inundation periods, tidal exchange, and sedimentation rates will decrease exponentially. Therefore, the one foot per year rate should be considered representative of the initial phases of evolution in subsided San Pablo Bay systems. A more detailed discussion of spatial and temporal effects on sedimentation rate is provided in Appendix E, Hydrology and Hydraulics Analysis.

2.3.8 Future Conditions Without a Project

Under the No-Action Alternative of this GRR (without project condition), the Hamilton Wetland Restoration Project would proceed as authorized, without BMKV, and with potential delays to implement the SLC component (314 acres), the Navy Ballfields (18 acres) and the seasonal wetland portion of HAAF due to uncertainties related to HTRW remediation. If the HWRP is not reauthorized to include BMKV, the SCC would continue to use the site for agricultural production for a few years. Following agricultural use, the site would remain inactive; the SCC would implement a maintenance program to control weeds and retain the integrity of fencing. The perimeter levees would not be breached and natural sedimentation would not occur. If the project site continues to be used in this manner, ground-surface settlement would likely continue to occur at its existing rate. Substantial alteration of natural topography and loss of soil resources capable of supporting sensitive wetland habitats would likely occur. The without project condition assumes that navigation projects will utilize the disposal sites designated under the LTMS implementation plan, as provided in Article II.F. of the HWRP PCA. Please see Appendix A for a detailed description.

2.4 PROBLEMS AND OPPORTUNITIES

2.4.1 Problems

2.4.1.1 Historical Decline of Wetlands

The historical decline of wetlands is a significant problem; this project is being proposed to restore important tidal salt marsh habitat to San Francisco Bay. Diking or filling them for purposes such as agriculture, housing, and salt production has destroyed approximately 90% of the original tidal wetlands of San Francisco Bay. This loss of tidal wetlands has greatly reduced the amount of habitat available to many species of fish and wildlife. Several local animal and plant species, including the salt marsh harvest mouse and the California clapper rail, have been listed as endangered due to the reduction of their wetland habitats.

2.4.2 Opportunities

2.4.2.1 Possible Delay of Hamilton Army Airfield and State Lands Commission Parcels

In expanding HWRP to include BMKV, there is an opportunity to ensure that available dredged material is beneficially reused, regardless of possible delays at the currently authorized HWRP. Due to the unpredictability of HTRW remediation, the HAAF and SLC parcels may not be available to receive material from the Oakland 50-foot project in 2005 and 2006. If the HWRP is expanded to include the BMKV parcel, portions of BMKV could be prepared for dredge material placement prior to HTRW remediation of the currently authorized HWRP (HAAF and SLC parcels), and dredge material could be placed on the BMKV portion while HTRW remediation is completed. If HWRP is not expanded to include BMKV, dredge material that would have been beneficially used may be lost to ocean disposal.

2.4.2.2 Increased Habitat Quality and Quantity

There is an opportunity to expand and enhance habitat quality and quantity. A substantial increase in project benefits could be achieved by expanding the project site to include the adjoining 1,610-acre BMKV property owned by the SCC. This would expand the total project site to approximately 2,600 acres (including the additional 2-acre access area). The actual habitat benefits accrued would undoubtedly be greater even than the large proportionate increase in the project size, because larger contiguous habitats are more robust and productive than smaller, more fragmented habitats. For example, the larger resident populations of endangered species, such as the California clapper rail, will have more genetic diversity and a greater area of refuge if habitat temporarily becomes degraded or eliminated on a portion of the site. Also, potential adverse impacts to resident species from activities outside the project site, such as predation by cats and dogs from adjacent developed areas, would be buffered by the increased size of the site. Restoration of tidal wetlands on subsided diked lands provides an opportunity to offset historic habitat losses. Expanding the Hamilton site to include BMKV is expected to realize the above opportunities. The site could be restored to the tidal action of the Bay by breaching the existing bayfront levee. The expanded site would provide 2,279 acres of tidal marsh, seasonal wetlands, transitional, and upland habitat (1,395 acres on the proposed BMKV addition, 884 acres on the authorized HWRP project lands). These figures exclude subtidal, intertidal channel, open water, and tidal mudflat habitats.

2.4.2.3 Unit-Cost Savings

There is an opportunity to accrue significant unit-cost savings from the expansion of HWRP to include BMKV. Perimeter levees of the current design fronting on the BMKV property would then not need to be constructed. Levees already exist along the perimeter of the BMKV property not fronting on the project site. These levees would need to be bolstered where they protect existing developed or farmed areas. However, the length of these levees is less than that of the levees that would not be needed, and the cost of bolstering the smaller length of existing levees would likely be significantly lower than constructing the new levee proposed in the current plan. Unit costs would also likely decrease due to the economies of scale for a larger site, for example by dividing equipment mobilization and offloading facility construction costs over a larger project.

2.4.2.4 Beneficial Reuse of a Greater Quantity of Dredged Material

This project would provide the opportunity to beneficially reuse a greater quantity of dredged material and would help with implementation of LTMS goals. The currently authorized project area would accommodate up to 10.6 million cubic yards of dredged material to restore habitat areas. The BMKV site would accommodate up to an additional 13.8 million cubic yards of dredged material to restore habitat areas.

The greatly increased acreage would provide a greater and longer-term benefit to implementing the LTMS program than the currently authorized project. This would result through the increase in the capacity for beneficial reuse of dredged material from Bay projects and because the unit cost of bringing material to the site would likely be decreased through economies of scale. Use of dredged material would accelerate the rate of marsh development, making habitat available to fish, wildlife, and particularly the endangered species that depend on tidal marsh for survival. In

addition reusing the material would alleviate, to an extent, the public concern about the environmental effects of aquatic disposal. Dredged material would be available from a variety of sources. The types of sources are briefly discussed below.

Maintenance Dredging Project Sources of Dredged Material
The selected sources of maintenance dredging materials for the combined project include six Corps Operations and Maintenance (O&M) projects and seven non-Federal O&M projects. The Federal O&M projects are Oakland Harbor, Pinole Shoals, Redwood City Harbor, Richmond Harbor and Southampton Shoals (including Richmond Outer Harbor and Chevron Long Wharf) and Petaluma River Channel (across the flats). The non-Federal O&M projects include the Larkspur Ferry Channel, dredging at Chevron, Tosco and Unocal docks, and berth dredging at the Ports of Oakland, San Francisco, Richmond and Redwood City.

New Work Dredging Project Sources of Dredged Material
The Port of Oakland 50-foot Project (Federal) is authorized to provide 2.5 million cubic yards of dredged material to the HWRP, 1.8 million cubic yards of sand and the remainder in fine-grained material. The proposed Bolinas Lagoon Restoration Project (Federal, if authorized) is considering an alternative that provides dredged materials to the HWRP.

Other potential new work dredging projects that could be future sources of dredged material for the combined project include the San Francisco International Airport Runway Expansion (non-Corps), Southampton Shoal Deepening (Corps), Redwood City Harbor Deepening (Corps) and Concord Naval Weapons Station Deepening (non-Corps).

Other Potential Sources of Dredged Material
There are several small sources of dredged material near the combined project site that may potentially be appropriate for this project. The most likely of these sources is the Bel Marin Keys Community Service District Maintenance Dredging. The community of Bel Marin Keys is located at the northern boundary of the project area. The Bel Marin Keys Community Service District is currently planning a 250,000 cubic yard maintenance dredging project in Novato Creek and the North Lagoon. Another possible source is the Marin County Flood Control and Water Conservation District.

Please see Appendix D for detailed information on the yearly volumes of dredged materials scheduled for placement at the combined project.

2.5 PLANNING CONSTRAINTS

Planning constraints are those concerns that must be considered while developing alternative plans. The following descriptions are not environmental assessments; instead, these constraints were used to limit the range of features proposed for this study. The environmental conclusions regarding these constraints are presented in the attached SEIR/EIS.

2.5.1 Minimization of Impact to Existing Threatened and Endangered Species Wetlands

Lowering the levee that separates the project site from Novato Creek to facilitate overflow onto the site during high flow events may create construction-related disturbance of adjacent tidal marsh vegetation and associated wildlife species. In addition, cutting channels through the outboard marshes to restore tidal action to the HAAF, SLC, and BMKV sites will directly impact some salt marsh habitat. Two endangered wildlife species, California clapper rail and salt marsh harvest mouse, may be present in the marsh. In addition, winter-run chinook salmon, Central California coast steelhead, and delta smelt could be present in the marsh channels. Impacts will be minimized during construction. By creating a significantly larger tidal salt marsh, major new habitat areas will be created for these species.

2.5.2 Minimization of Potential Loss of Adjacent Tidal Marsh Habitat

The eastern (San Pablo Bay) and northern (Novato Creek) margins of the project site support mid-and low-marsh habitats that may be lost through the construction of breaches and tidal connecting channels, and because of changes in channel width in Novato Creek associated with increased tidal prism.

To address these concerns, breaches and tidal connecting channels should be located in areas with little or no outboard marsh. In addition, imported dredged material or on-site material should be used to accelerate the development of surface elevations suitable for the establishment of tidal marsh vegetation. Levees may be constructed along marsh basin divides to facilitate construction phasing and reduce the temporal loss of tidal marsh vegetation. However, phase levees will restrict tidal flow between the basins and may provide movement corridors for non-native predators.

2.5.3 Novato Sanitary District Facilities

The Novato Sanitary District (NSD) outfall pipeline runs between the HAAF and SLC property. The outfall extends into San Pablo Bay, discharging into shallow water. The outfall, pipeline and associated facilities must be protected from construction impacts, settling, offshore activities, and changes in elevation as the airfield is filled in to form a wetland. The section of the pipeline through the wetland must remain accessible for inspection and maintenance. An access berm would be constructed along the length of the pipeline that runs through the marsh to allow access for routine maintenance. This berm would create a hydrological separation between the combined BMKV and SLC parcels and the HAAF parcels.

2.5.4 Drainage Infrastructure

The existing drainage infrastructure causes precipitation and storm water runoff that enters the project site to be reduced by pumping and discharged into San Pablo Bay. Removing the pumping station and filling the existing drainage infrastructure would keep the water in the site.

2.5.5 Pacific Gas & Electric Company High Tension Electric Transmission Line Towers

Five PG&E transmission line towers are located in the northern portion of the BMKV site adjacent to Novato Creek. The base of these towers must be protected from erosion and corrosion associated with tidal inundation. Jacketing the base of the towers with concrete is the preferred alternative that has been used at other nearby projects including the Sonoma Baylands Project.

2.5.6 Dredged Material Suitability

Only dredged materials that have chemical concentrations and sediment toxicity below levels that could harm wetland biota will be accepted for this project. Regional dredged material testing guidelines are provided by the LTMS agencies in the Corps of Engineers, San Francisco District, Public Notice 01-01, *Guidelines for Implementing the Inland Testing Manual in the San Francisco Bay Region*. The current regional guidance specific to the chemical suitability criteria for dredged material use in tidal and seasonal wetland restoration projects, upland habitat creation, and other upland uses is contained in the *Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region, Management Plan 2001*.

2.5.7 HTRW

Contamination related to former agricultural use is likely to be present on the BMKV site. The SCC is responsible for all remediation measures and has performed sampling of the BMKV site. SCC has consulted with DTSC and does not anticipate any necessary remediation to impact the addition of BMKV to the authorized HWRP. SCC is also responsible for any remediation necessary to achieve the project purpose of public access on the 2-acre portion of the Bulge area required for the Access Area.

2.5.8 Protection of BMK Residential Community

Breaching the outboard levee would allow tidal waters to flood the Bel Marin Keys residential community. Protecting the Bel Marin Keys residential community from tidal inundation and flooding would require either constructing a new levee or modifying/improving the existing levee separating Bel Marin Keys south lagoon from the project site.

2.5.9 Limited Flood Storage Volume at Pacheco Pond

At present, Pacheco Pond provides an estimated flood storage volume of 866 acre-feet at an elevation of approximately 7 feet NGVD. Enlarging the pond to create additional storage capacity, as proposed in Alternative 1, may reduce its existing water surface elevation and thus result in the loss of wetland habitat. Raising the levee between the pond and the project site to prevent overtopping may increase backwater flooding along Pacheco and Arroyo San Jose Creeks or overtop existing levees at the confluence of the conveyance channel and Novato Creek and at the Leveroni property.

2.5.10 F-2 Flood Zoning and Ponding Covenants

The site is currently under F-1 (primary floodway) and F-2 (secondary floodway) overlay zoning pursuant to the Marin Countywide Plan and is subject to flood protection covenants that restrict development to ensure that the site fulfills a flood protection function for adjacent parcels. The project must be designed to avoid any negative impact on flood risk to adjacent properties.

2.5.11 Scour

Installing water control structures to re-route flows from Arroyo San Jose and Pacheco Creeks (Pacheco Pond) through the project site to reduce the flooding potential may reduce scour and increase sediment deposition (i.e., reduction in channel depth) in Novato Creek downstream of the confluence with the conveyance channel. The project must be designed to minimize impacts associated with scour or to mitigate those impacts if they are unavoidable. Please refer to the SEIS/R for analysis concerning this constraint (Impact TH-3).

2.5.12 Public Access, Privacy, and Compatibility Issues

Providing designated public access to project site along new levees may create privacy and security concerns for Bel Marin Keys residents. Establishment of a segment of the Bay Trail along the western portion of the project site may present incompatibility issues between wildlife well-being and public access. A discussion of the potential impacts and associated mitigation can be found in Sections Impact BIO-34 and Impact BIO-35, in the SEIR/EIS.

2.5.13 No Net Loss of Wetlands

No net loss of total wetland habitat would occur under any of the alternatives; however, creating tidal exchange at the project site and constructing the internal levees would result in the loss of agricultural ponding habitat (agricultural wetlands) totaling approximately 151 acres, based on the ponding analysis conducted as part of the wetland delineation. Because of their size, location, and level of disturbance, these wetlands provide few of the functions and values of higher quality seasonal or other wetlands. Under Alternative 1, approximately 40 acres of seasonal wetlands, 40 acres of open water habitat, 10 acres of freshwater emergent wetland, and 1,039 acres of tidal wetlands would be restored. Under Alternative 2, approximately 210 acres of seasonal wetland and 1,039 acres of tidal wetlands would be restored. As revised, Alternative 2 would restore 899 acres of tidal wetland, 277 acres of seasonal wetland, 12 acres of freshwater emergent wetland and 21 acres of open water habitat. Under Alternative 3, 40 acres of open water habitat, 10 acres of emergent marsh and 1,274 acres of tidal wetlands would be restored. The Draft SEIS/SEIR indicates that the loss of agricultural wetlands is considered less than significant because of the relatively low value of the wetlands and because the loss would be offset by the establishment of both in-kind and out-of-kind replacement wetlands expected to be of higher quality.